

A4
SPD

GHV0 logic [402] 401. GHV0 logic 401 may be a register having a two-way multiplexer input. A first input to the multiplexer portion is coupled to an output of multiplexer (MUX) 414. Multiplexer 414 selects for outputting a GHV value from one of several paths that are rendered active in response to an event, cache miss, branch misprediction, pipeline hold, etc. that may modify the value of one GHV. Each of these paths and the operation of GHV logic 311 will be described in detail below.

IN THE CLAIMS

ASPL

(1) Please cancel claims 1-9 and 11-20 without prejudice or disclaimer.

(2) Please rewrite claim 10 as follows:

10. (Amended) A processing system comprising:

2 a first branch history table comprising a plurality of bimodally accessed entries
3 for storing a first set of branch prediction bits;

4 a second branch history table comprising a plurality of fetch-based accessed
5 entries for storing a second set of branch prediction bits;

6 a selector for selecting in response to a selection control bit selected from a set of
7 selection control bits, a bit from a selected one of said sets of bits accessed from said first
8 and second branch history tables; and

9 a selector table comprising a plurality of entries for storing said a set of selector
10 bits as a function of a performance history of said first and second sets of branch
11 prediction bits stored in said first and second branch history tables, wherein said each
12 said entry in said tables comprises a 1-bit counter.

(3) Please add new claims 21-40 as follows:

1 *2*
21. (New) Branch prediction circuitry comprising:

3 a bimodal branch history table comprising a plurality of entries each for storing a
prediction value and accessed by selected bits of a branch address;

41
5
6
7
8
a fetch-based branch history table comprising a plurality of entries for storing a prediction value and accessed by a pointer generated from selected bits of said branch address and bits from a history register, each entry of the fetch-based branch history table operable for containing bits representing a prediction value for a plurality of branches in a fetch group; and

9
10
11
12
13
a selector table comprising a plurality of entries each for storing a plurality of selection bits and accessed by a pointer generated from selected bits from said branch address and bits from said history register, each said selector bit used for selecting between a bimodal prediction value accessed from the bimodal history table and a prediction value accessed from said fetch-based history table.

1
2
22. (New) The branch prediction circuitry of Claim 21 and further comprising circuitry for updating said bimodal and fetch-based branch history tables operable to:

3
4
set a corresponding entry in each of said bimodal and fetch-based branch history tables to a first value when a branch is taken at branch resolution time; and

5
6
set a corresponding entry in each of said bimodal and fetch-based branch history tables to a second value when a branch is not taken at branch resolution time.

1
2
3
4
23. (New) The branch prediction circuitry of Claim 21 wherein said history register comprises a shift register and said branch prediction circuitry further comprises circuitry for updating said shift register by shifting in a preselected prediction value for each fetch group.

1
2
24. (New) The branch prediction circuitry of Claim 21 and further comprising circuitry for updating said selector table operable to:

3
4
5
update a corresponding bit in a selected entry in said selector table with a first value when a bimodal prediction value from said bimodal branch history table correctly represents a corresponding branch resolution; and

6
7 update a corresponding bit in a selected entry in said selector table with a second
8 value when a fetch-based prediction value from said fetch-based branch history table
correctly represents the corresponding branch resolution.

1 25. (New) The branch prediction circuitry of Claim 21 wherein the plurality of
2 selection bits are operable for selecting a first subset of prediction values from the
3 bimodal branch history table and a second subset of prediction values from the fetch-
4 based branch history table.

1 26. (New) The branch prediction circuitry of Claim 23 wherein said circuitry for
2 updating said selector table is further operable to maintain a value in a selected entry in
3 said selector table when corresponding values from said bimodal and fetch-based branch
4 history tables both correctly represent a corresponding branch resolution, and wherein
5 said circuitry for updating said selector table is further operable to maintain a value in a
6 selected entry in said selector table when neither values from said bimodal and fetch-
7 based branch history tables correctly represent a corresponding branch resolution.

1 27. (New) The branch prediction circuitry of Claim 23 wherein said circuitry for
2 updating said selector table is further operable to set a value in a selected entry in said
3 selector table to a value associated with said fetch-based table when corresponding values
4 from said bimodal and fetch based branch history tables both do not correctly predict a
5 corresponding branch resolution outcome.

1 28. (New) A processing system comprising:
2 a first branch history table comprising a plurality of bimodally accessed entries,
3 each entry for storing a first set of branch prediction bits;
4 a second branch history table comprising a plurality of fetch-based accessed
5 entries each entry for storing a second set of branch prediction bits;

6
7
8
a selector for selecting, in response to a plurality of selection control bits, a set of
prediction bits from a selected one of said sets of bits accessed from said first and second
branch history tables; and

9
10
11
12
a selector table comprising a plurality of entries, each entry for storing a plurality
of selection control bits wherein the selection control bits are set as a function of a
performance history of corresponding first and second sets of branch prediction bits
stored in said first and second branch history tables.

1
2
29. (New) The processing system of Claim 28 wherein said entries of said
selector table are accessed using fetch-based accessing.

1
2
30. (New) The processing system of Claim 28 wherein each said entry in
said tables comprises a 1-bit counter.

1
2
31. (New) The processing system of Claim 28 wherein said first and second
branch history tables and said selector table form a portion of a branch execution unit.

1
2
32. (New) The processing system of Claim 31 wherein said branch execution
unit forms a part of a microprocessor.

1
2
33. The processing system of Claim 32 and further comprising memory
coupled to said microprocessor.

1
2
3
34. (New) A method of performing branch predictions in a processing system
including a bimodal branch history table, a fetch-based branch history table and a selector
table, the method comprising the substeps of:

4
5
accessing the bimodal branch history table to retrieve a first set of branch
prediction bits;

6
7
accessing the fetch-based branch history table to retrieve a set of second branch
prediction bits;

8
9
10 selecting between the first and second sets of branch prediction bits in response to
11 corresponding bits retrieved from the selector table, wherein a sum of a number of bits in
the first set of branch prediction bits and a number of bits in the second set of branch
prediction bits is not less than a number of instructions in a fetch group; and
12 updating the selector table as a function of actual branch resolution.

1 35. (New) The method of Claim 34 wherein said step of updating the selector
2 table comprises the substeps of:

3 determining if at least one of the first set of branch prediction bits correctly
4 predicts the corresponding branch resolution outcome;

5 updating the corresponding entry in the selector table to a first logic value when
6 the at least one of the first set of prediction bits correctly represents the branch resolution
7 outcome;

8 determining if at least one of the second set of branch prediction bits correctly
9 predicts the branch resolution outcome; and

10 updating the corresponding entry in the selector table to a second logic value
11 when the at least one of the second set of branch prediction bits correctly represents the
12 branch resolution outcome.

1 36. (New) The method of Claim 35 and further comprising the steps of:
2 determining if at least one bit of both the first and second sets of branch history
3 bits correctly predict the branch resolution outcome;

4 maintaining the current value of corresponding bits in the corresponding selector
5 table entry when the at least one bit of both the first and second sets of branch prediction
6 bits correctly predict the branch resolution outcome;

7 determining if at least one bit of both the first and second sets of branch
8 prediction bits incorrectly predict the branch resolution outcome; and

91
10
11
~~12~~
maintaining the current value of corresponding bits in the corresponding selector table entry when the at least one bit of both the first and second sets of branch history bits incorrectly predict the branch history outcome.

1 37. (New) The method of Claim 35 and further comprising the steps of :
2 determining whether at least one bit of both the first and second sets of branch
3 prediction bits correctly predict the branch resolution outcome;

4 maintaining the current value of corresponding bits in the corresponding selector
5 table entry when at the least one bit of both the first and second sets of branch prediction
6 bits correctly predict the branch resolution outcome; and

7 updating the current selector table entry to a logic value associated with the fetch-
8 based branch history table when neither of corresponding bits of the first and second sets
9 of branch prediction bits correctly predicts the branch resolution outcome.

1 38. (New) The method of Claim 34 wherein said step of accessing the fetch-
2 based branch history table comprises the substep of generating an address from at least
3 some bits of a branching instruction and bits retrieved from a history register.

1 39. (New) The method of Claim 38 wherein the history register comprises a shift
2 register.

1 40. (New) The method of Claim 39 wherein said method further comprises the
2 steps of updating the shift register by shifting in a prediction bit for each fetch group.

REMARKS

Claims 1-20 are pending in the Application.

Claims 1-9 and 11-20 have been cancelled.

Claims 10 stands rejected.

New claims 21-40 have been added.